Environmental Engineering and Management Journal *April 2013, Vol.12, No. 4, 657-664*
http://omicron.ch.tuiasi.ro/EEMJ/

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NUMERICAL MODELLING OF CHLORINE DISTRIBUTION IN AN URBAN WATER SUPPLY SYSTEM

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Abstract

A simplified numerical model of the water distribution network of a medium sized town (with 30,000 inhabitants), of elongated shape, was implemented in EPANET. The decay of chlorine residual concentration in the above mentioned network was studied, using the extended time analysis capabilities of EPANET, for a 3 days period. The water supply system, composed of one tank, 86 pipes and 52 nodes is driven by gravity. The chlorine is injected at the tank with a constant concentration amount. The variable water flow rates on the pipes of the network were modeled by means of a variable demand pattern, introduced at the end nodes of the system. The variation period of the demand pattern was set to 24 hours with a one hour time step. Water quality computation time step was set to 0.02 min, in order to ensure accurate prediction of chlorine concentrations, while hydraulic computation time step was set to 1 min. Both water quality and hydraulic analyses were conducted to depict the temporal variations of the flow rates, reaction rates, and chlorine residual concentrations in network's pipes and nodes. Pipe wall reactions and bulk flow reactions were modeled using both first-order and second order decay laws. The computed concentration values of the chlorine residual are above the lower admissible limit over the last 48 hours of the simulation period. The results obtained here for the decaying process described by the second order reaction law are trustworthy with respect to the ones obtained for the first order assumption.

Key words: EPANET, water distribution network, water supply, chlorine, water quality

Received: December, 2012; Revised final: April, 2013; Accepted: April, 2013

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